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cen·pe·co® LUBRICANTS

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The 5W-20 Death Match

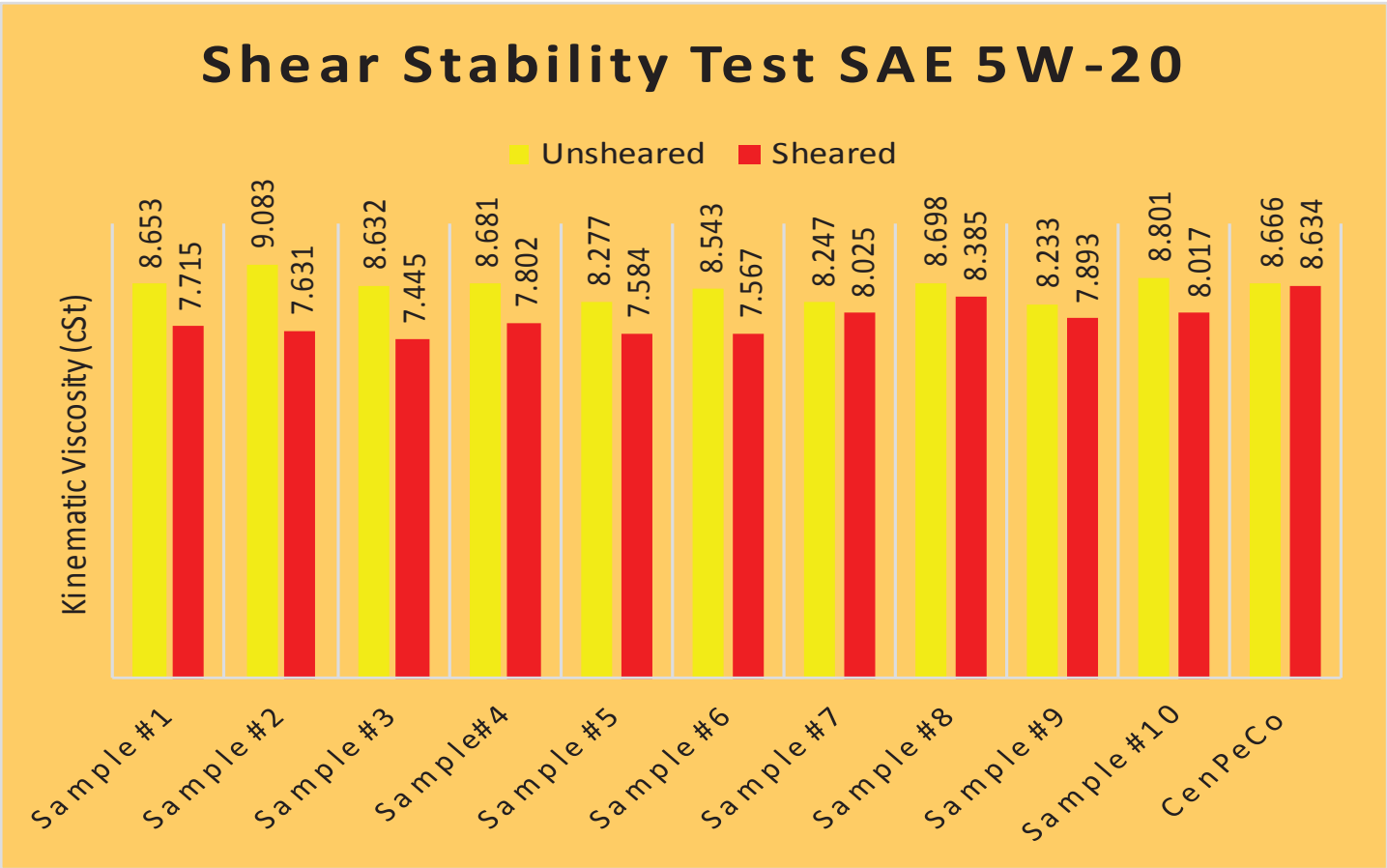
By Blaine Ballentine

It was reported earlier this year that the American Automobile Association found that synthetic oils performed an average of 47% better than conventional oils in industry standard tests. Of course, averages can be misleading, so we delved into the details. The AAA uncovered a weakness in oil specifications, which lead to testing of one of our products with extraordinary results.

Procedures

The American Automobile Association selected five oil brands offering both conventional and synthetic products. They obtained samples of SAE 5W-20 in each type. So, five 5W-20 oils labeled synthetic were compared with five 5W-20 oils marketed as conventional.

A series of bench tests was performed on



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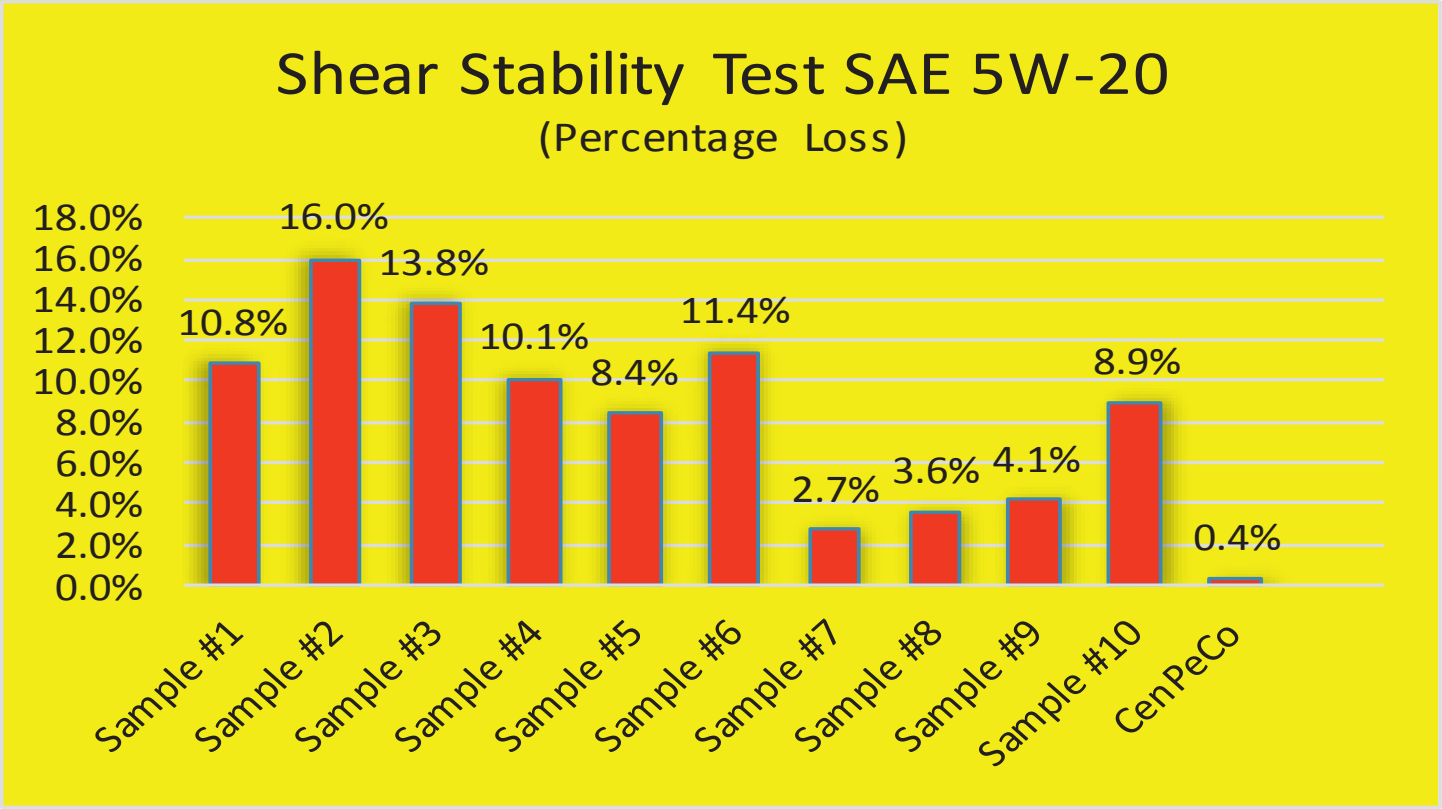

each oil. The tests included:

- High Temperature High Shear (HTHS)
- Shear Stability
- Thermo-Oxidation Engine Oil Simulation Test (TEOST)
- Moderately High Temperature TEOST (TEOST MHT)
- Noack Volatility
- Pumpability
- Thin Film Oxygen Uptake Test (TFOUT)
- Romaszewski Oil Bench Oxidation (ROBO)

Although these are all standard industry tests, some are screening tests and not required by API specifications. For example, the ASTM D6278 Shear Stability test is not required by API SN. Oil companies use it as a pre-test to determine if they want to gamble on passing the expensive Sequence VIII engine test which requires stay-in-grade viscosity performance.

A Loaded Test

Synthetic base oils provide superior cold temperature flow, lower volatility, and better oxidation stability. They have higher viscosity indicies, so they require less polymer when making a multi-grade, giving them an advantage in shear stability.

Only one of the tests, the HTHS, does not give synthetic oils a clear theoretical advantage. The averaged results of the bench testing were what one would expect, especially with a really thin oil like 5W-20.

Averaging hides the fact that the best mineral base oil outperformed the worst synthetic oil in nearly every test. The only exception was the volatility test, where every synthetic oil had lower volatility than every conventional oil.

There were no tests measuring wear, which is understandable. The API specifications rely on engine tests to evaluate wear performance, and engine tests are really expensive. However, there is a bench test called the Ball Rust test that is required by API SN that may give a theoretical edge to conventional oils, but was not selected for the research.

API SN requires only two oxidation bench tests, but AAA research used four, and no rust or wear tests. The test slate would seem to be somewhat biased toward synthetic oils.

Compound Testing

What we found most interesting in the AAA

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research was that they ran HTHS viscosity on sheared oil.

Engine manufacturers rely on High Temperature High Shear viscosity as the best measure of sufficient film thickness to protect their bearings. The test is run in a Tapered Bearing Simulator, where the oil is heated to 150° C (302° F) and viscosity is measured by drag on a rotor, which induces temporary shear. To qualify as SAE XW-20, the oil's HTHS viscosity has to be at least 2.6 cP. All ten of the oils in AAA's research passed.

The samples were also tested for shear stability. In this procedure the oil is cycled through a diesel injector nozzle 30 times. The shearing action as the oil is sprayed through the sharp edges of the nozzle orifices literally tears the polymer molecules in the oil, causing a permanent loss of viscosity. The viscosity at 100° C. after shearing is compared with viscosity before shearing and the result is expressed as percentage loss.

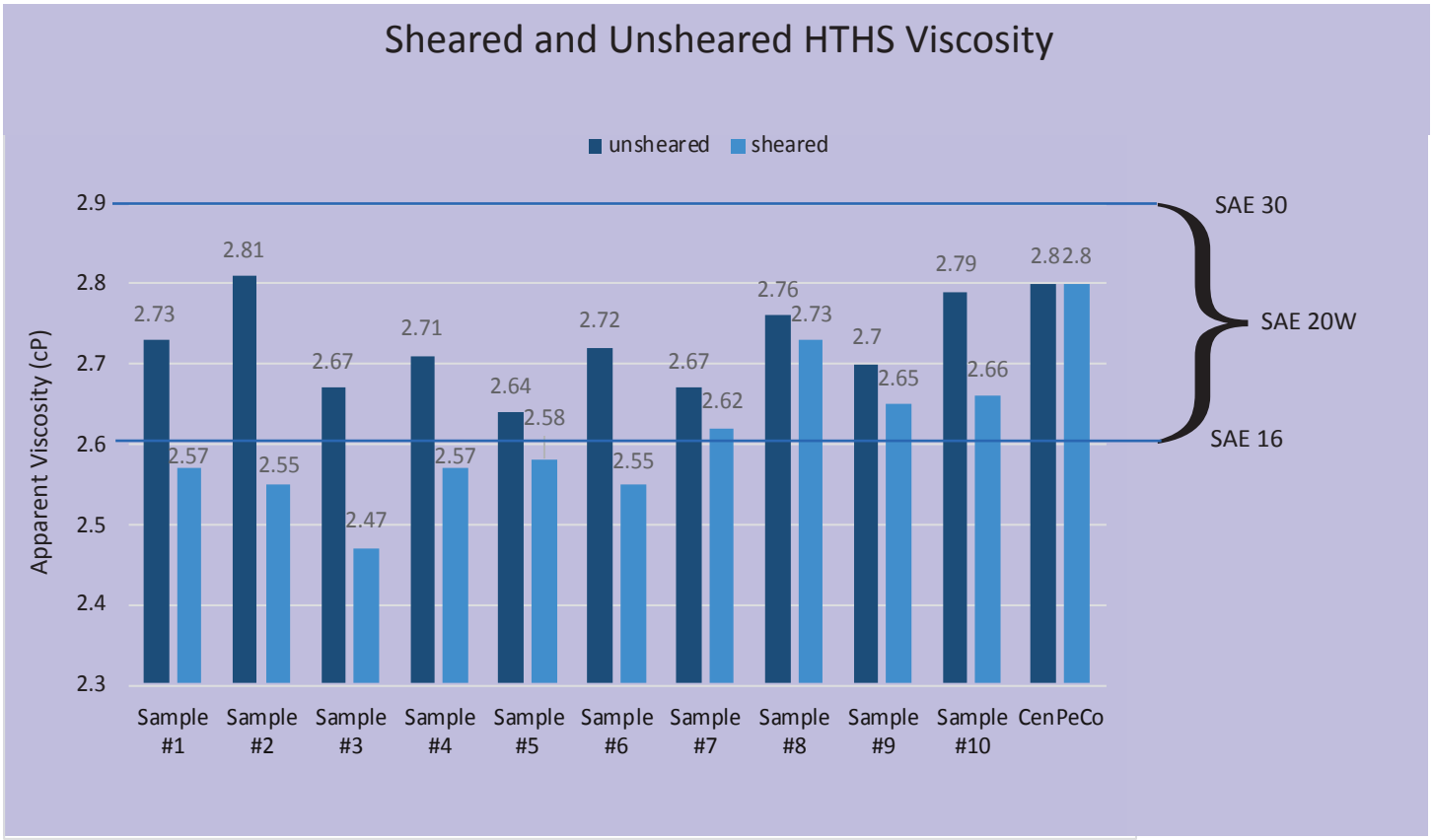
Then in AAA testing, the sheared oil's HTHS viscosity was tested. Six of the ten samples failed to meet the 2.6 cP minimum requirement—all of the conventional oils and one of the synthetic oils.

The API and SAE require a minimum of 2.6 cP HTHS viscosity on new oil. There is no requirement to run HTHS vis on sheared oil, so nobody is suggesting the test oils did not meet specifications.

Think about how these bench tests relate to oil in an engine though. As the oils runs through the engine, the shearing forces cause it to lose viscosity. That same oil is then pumped through the bearings. So, it makes a lot of sense to run the shear stability test and then run the HTHS viscosity on the sheared oil because that more closely simulates what happens in the engine.

CenPeCo's Perspective

It is kind of scary to think about a thin-as-water oil shearing out and not meeting SAE specifications only a few miles into an oil drain interval, especially when the specification relates directly to bearing wear. So, we decided to test our 5W-20 to see how it compares.



First we should point out that even though the product name is CenPeCo PV Synthetic Blend, the 5W-20 version is fully synthetic. We prefer paraffin base oil or paraffin/synthetic blends for

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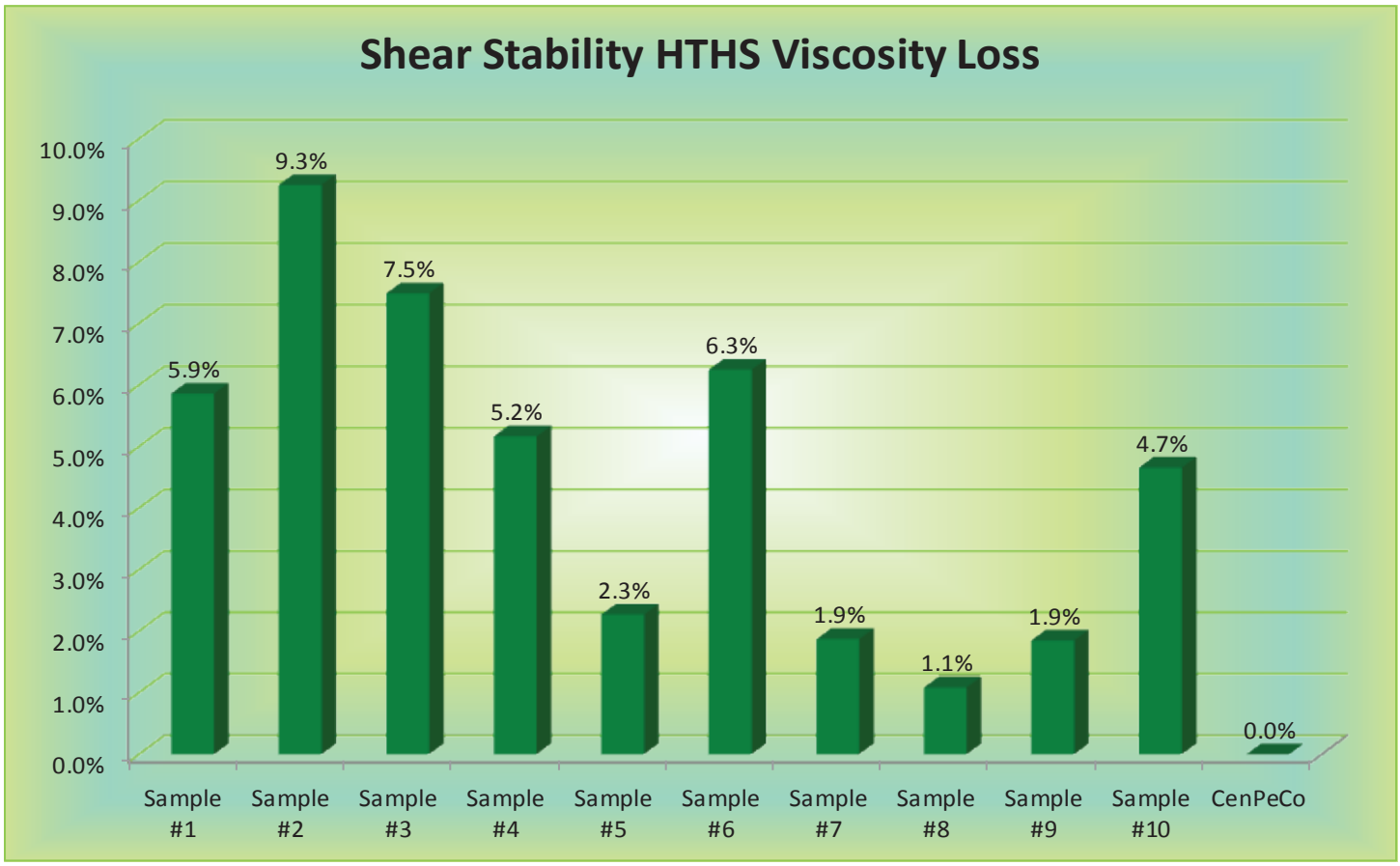

thicker grades, but the superior oxidation and volatility performance of synthetic oil makes sense when making really thin oil for gasoline engines, especially in the face of increasingly long drain intervals.

A sample of PV Synthetic Blend 5W-30 was sent to Savant Laboratory in Dearborn, Michigan for testing. HTHS viscosity on the new oil, shear stability, and then HTHS with the sheared oil was tested using the same ASTM procedures used in the AAA research. The numbers are in the graphs shown in this article, along with the numbers generated in AAA's testing, to sum it up, our results were stellar. Essentially, our oil did not shear in the 30 pass Shear Stability test, losing only .37%. Now theoretically that would mean a drop in the HTHS viscosity. However, if there was a drop, it was too small to measure. The HTHS viscosity on our 5W-20 was the same after shear as before.

Conclusion

At Central Petroleum we endeavor to make the best lubricants possible. We try to use the best materials for a given application, which means we use Pure Paraffin base oil in most of our products. On the other hand, synthetic base oils are better for really thin oils, such as PV Synthetic Blend 5W-20 and Synthetic ATF. In our effort to make the best lubricant possible, we search for the most robust additive packages and we use the most shear stable polymer.

We keep such high quality materials on hand to make the best heavy duty lubricants we can. Passenger car oils are secondary for us. So, we are more than a little bit proud when we compare our passenger car oil with what the AAA considers representative of the industry and we stand head and shoulders above them. Further, we deliver this premium performance with a fully synthetic product priced well below the average for synthetic passenger car oils.

Reference

AAA Engine Oil Research: AAA Proprietary Research into the Differences between Conventional and Synthetic Oil, American Automobile Association, May 2017.